III. EPIDEMIOLOGIC INVESTIGATIONS

A. DISEASE OUTBREAKS

1. Introduction and Background

An outbreak is the occurrence, in a community or region, of individuals who are identified as cases of an illness in excess of what is normally expected. The number of cases in an outbreak will vary according to the infectious agent, the size of the population exposed, and the time and place of occurrence. The outbreak or epidemic is relative to the usual frequency of the disease in the same area among the specified population at the same time of the year. Defining an outbreak is directly related to the surveillance activities performed at the local, state and national levels.

2. Procedure for Epidemiologic Investigations

This procedure for the investigation and determination of the existence of an outbreak is consistent regardless of the disease being investigated. The steps in this procedure include:

a) Establish the Existence of an Outbreak or Epidemic

Establish the existence of an outbreak by comparing available information about new cases with the incidence of the disease in a comparable geographic region during a comparable time period in preceding years.

b) Verify Diagnosis

Analyze clinical histories of cases and have laboratory tests performed to confirm or refute the diagnosis and determine the type of etiologic agent associated with the illness (e.g., bacterial, viral, mycotic, chemical, or other). Establish a case definition with a standard set of criteria to determine whether a person should be classified as having the health condition of interest.

c) Relate the Outbreak to Time, Place and Person

Conduct a survey of known or selected cases and become familiar with the community situation. Interview these cases to determine their common experiences, such as when they became ill (time), where they became infected (place), and who they are (person). Make case counts and relate these to the appropriate population to determine those groups at risk. Contact those with information on the illness or environmental circumstances contributing to the outbreak. A pattern can often be recognized in the results of these procedures.

d) Formulate a Tentative Hypothesis

Formulate a tentative hypothesis to explain the most likely cause, source, and distribution of the cases. This hypothesis is based on data and facts that have been collected and can only be tentative; no conclusions can be reached at this point in the investigation. The tentative hypothesis directs the course of an investigation and is tested by data gathered during the investigation. Develop several hypotheses if necessary. A series of hypotheses may evolve during an investigation. First, facts are examined, broad hypotheses are formulated, then more facts are gathered, then a specific hypothesis is formulated. The case definition may need to be modified based on new data. Next, additional facts to test the acceptability of the hypothesis are gathered. The cycle is continued as necessary.

e) Plan a Detailed Epidemiologic Investigation

Determine from the collected data what additional information is needed and what resources are available to test the hypothesis. Develop or obtain interview forms, gather specimen collection kits, and alert and train people involved in the investigation.

f) Conduct the Investigation

Interview non-ill persons (controls) who are similar or who had similar time or place experiences to those ill; gather appropriate community and environmental information; investigate potential sources of the responsible agent and factors that contributed to the outbreak; and collect specimens and samples.

g) Analyze and Interpret Data

Conduct laboratory tests and summarize field investigations. Compare and interpret all information collected and results of tests conducted. Construct epidemic curves, calculate rates, develop appropriate tables and charts, apply statistical tests, and interpret the cumulative data.

h) Test Hypotheses and Formulate Conclusions

Accept or reject the hypothesis on the basis of the available data and appropriate calculations. For a hypothesis to be acceptable the patterns of disease in the host must fit the nature of the agent, its source, its mode of transmission, and the contributory factors that allowed the outbreak to occur. If the hypothesis is rejected, another hypothesis must be developed and additional information must be gathered to test this new hypothesis.

i) Put Control Measures Into Operation

Devise effective control measures based upon the evidence uncovered. Use the information collected during the investigation for controlling not only the current situation but also for preventing future problems in the community. Initiate or intensify surveillance of the disease and agent. If imminent danger exists, control measures may be initiated after a tentative hypothesis has been formed. If the hypothesis proves to be wrong, corrected measures can be taken at an appropriate point.

j) Prepare a Report of the Investigation

Investigations should be summarized as soon as completed and a report should be sent to the state epidemiologist. The report should include the types of information listed in the sample on the following pages.

3. Requesting Outbreak Assistance

There is no standard formula which will answer the question of when outbreak assistance should be requested.

As a general rule, the DPH does not provide on-site assistance to LHDs for routine communicable disease outbreaks. However, if an outbreak is suspected and the LHD needs technical, material or personnel assistance for an epidemiologic investigation, the health officer should contact the state epidemiologist, who may request that an "Epi" Rapid Response Team member assume the lead role. Team members will provide consultation and communicate with the state staff.

Consultation with the state epidemiologist should **always** be sought when: **(1) the pattern of illness appears to be unusual, (2) the etiology of an unusual disease occurrence is not known, or (3) severe disabling (hospitalization, death) consequences are occurring.**

4. Local Health Department Responsibilities:

The LHD is expected to:

a) Conduct the initial investigation of a suspected outbreak.

b) **Notify the state epidemiologist of any suspect disease outbreak under investigation. Epidemiologic consultation by telephone should be sought early in the investigation**.

c) Request assistance of the state epidemiologist if needed to control further spread of the outbreak.

d) Assume local costs of the investigation. The DPH will cover expenses incurred by DPH staff when on-site.

e) Obtain laboratory specimens and conduct interviews and other related investigation efforts as requested by the state epidemiologist.

f) Prepare and submit an outbreak investigation report.

5. State Epidemiologist Responsibilities:

The state epidemiologist is expected to:

a) Provide consultation and technical assistance for local and state regional staff for the outbreak investigation.

b) Provide guidelines for the investigation and control of the specific outbreak consistent with state and national objectives, current policy, and current medical literature.

c) Determine whether a particular outbreak warrants further investigation and the nature and extent of additional information and laboratory data required.

d) Identify and arrange additional staff and material resources from the DPH in the event an outbreak exceeds the staff and resource capacity of the LHD and the DEHP. DPH staff reassigned to assist in the outbreak investigation will report to the state epidemiologist until assistance is no longer needed.

e) Provide vaccines in accordance with established protocol for hepatitis A and B, measles, mumps, rubella, diphtheria, tetanus, pertussis, polio, varicella, rabies and medications for treating and preventing tuberculosis and STDs. Also provide standard immune globulin in outbreaks of hepatitis A if the state epidemiologist approves the need.

f) Initiate additional control measures in consultation with the LHD.

6. Role of the Centers for Disease Control and Prevention

CDC staff provide on-site assistance **only** upon the request of the DPH. In Kentucky the state epidemiologist makes the request. The CDC staffs serve as consultants to the state epidemiologist unless an alternative agreement is made. Occasionally, upon prior agreement with the state epidemiologist, CDC will conduct an independent investigation.

B. COMPONENTS OF AN OUTBREAK INVESTIGATION REPORT

1. Reason for Investigation

Brief statement as to how the outbreak became known.

2. Investigation

a) Date investigation began and individuals interviewed.

b) Number of cases.

In a smaller outbreak (25 or less), present these cases individually in the form of a table, line listing under the headings “name”, “sex”, “age”, “date and time of onset” (with exact hour in military time), “address” and such other headings as may be pertinent to the outbreak. **Arrange the cases according to date of onset**. If a table of individual cases is included, incorporate the more important clinical and laboratory findings in the table. Maintain the confidentiality and privacy of the individual cases within this report.

If there are too many cases for such a table, give the information in numbers only; total number of cases, sex distribution, age distribution, and range of dates and time of onset.

c) Compare prevalence of the disease in the outbreak with previous known prevalence in the population group involved.

d) Clinical description of the symptoms and physical findings, with the results of laboratory examinations.

e) Epidemiologic data.

1) Provide pertinent information regarding the distribution of the cases that would indicate the source, such as confined to the customers of a certain dairy, inmates of a certain ward, etc.

2) If an outbreak is localized to a group, such as in an institution or in connection with a dinner, give the total population at risk (total population potentially exposed).

3) Present in tabular form the association of individual characteristics (e.g., age, history of previous attack, immunization, etc.), with the cases. Where possible, compare these case characteristics with “well” individuals.

4) Present in tabular form, the association of cases with various environmental factors such as water, milk, foods, etc. Compare these cases with the general population when possible.

f) Results of investigation of common food and drink supplies.

1) If the outbreak requires data about the water or milk supply, summarize the reports or finding of the milk sanitarian, engineer, or veterinarian.

2) Summarize the results of bacteriologic examination of suspected foods.

3) Provide details of preparation, handling and storage of suspected foods, brands of these foods, and places where they were purchased.

g) Provide information as to illnesses, family illness, or infections among food handlers.

3. Discussion as to Source

State reasons for suspecting or excluding milk, water, and each article of food or other possible vehicle of infection.

4. Conclusions

State your opinion as to:

a) Nature of illnesses.

b) Source of outbreak.

c) Method of transmission.

5. Summary of Control Measures

a) Immediate control.

b) Future prevention.